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Scale, history and justice in community wind energy: An empirical review

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ABSTRACT

Although there is a clear positive link between community wind energy (CWE) projects and social acceptance, there is still empirical and conceptual ambiguity concerning the details of *why*. To fill this gap, we revisit foundational papers in this field and then, focusing on empirical case studies between 2010 and 2018 (n=15), trace how recent research has engaged with existing conceptual frameworks. Most empirical researchers verify the importance of the two key dimensions defined by Walker & Devine-Wright [1]: process and outcome, and then relate this to procedural justice and distributive justice. Meanwhile, the core concept of "community" has been deployed, in both practice and research, in so many different and sometimes ambiguous ways that it remains difficult to assert if, and how, community-based renewable energy policy and siting practice produces high levels of local community acceptance. We suggest that parsing out the scale of investment in wind energy projects and the local historical context of energy transitions add clarity to the Walker & Devine-Wright framework as it relates CWE;

providing important conceptual nuance for guiding policy, developer practices and future empirical research.

Keywords: community wind energy; scale; investment; process; financial benefits; social acceptance

Highlights

- We build on Walker & Devine-Wright's 2008 [1] framework describing the role of process and outcome for defining energy projects by specifying how it relates to recent empirical research on community wind energy.
- We review 15 key empirical studies that have engaged with community wind energy case examples between 2008 and 2018, and relate them directly to the Walker & Devine-Wright framework..
- We suggest that scale of investment, benefits distribution and the local historical context of energy transitions merit specific research attention in a modified version of Walker & Devine-Wright's [1] framework as it relates to community wind energy

Introduction

Community renewable energy (CRE) – and community wind energy (CWE) in particular - has been applauded and studied by researchers (e.g. [1,2,3,4]), governments [5,6] and other stakeholders [7], for a multitude of reasons in recent years. Broadly speaking, CRE is favoured as a development option for providing diverse local benefits that include increasing resiliency [8], capacity building [9], increasing awareness of sustainable energy [10], making energy production visible [12], furthering other kinds of low-carbon development [12,13], and improving local environments [14]. Further, CWE development models have the potential to address low local acceptance of, and more organized opposition against, wind energy projects [15,16,17]. That is, CWE ostensibly addresses the dual goals of advancing: environmental justice for host communities, and a lower carbon future globally. Despite opinion polling that shows widespread support for renewables — including wind energy —in the general public, local resistance can stall or halt projects permanently [18]. While we acknowledge that opposition and acceptance operates at a variety of scales [19], the community aspects of CWE tend to be primarily played out at a very local level and there is evidence from several European and North American jurisdictions that local opposition has been effective and widespread enough to influence national policy on energy and planning (e.g.,[15, 20]). Thus, social acceptance is an important determinant of whether or not a specific wind energy development is built and operates in relative harmony with local residents and CWE is an important determinant of social acceptance. Yet, few have empirically explored if and particularly, *why* there is a connection between the two.

For over three decades social scientists have been disentangling the multitude of factors shaping renewable energy project outcomes, including local acceptance of wind energy developments [21]. Most of this research has taken place in Europe [22,23,24,25,26] and North America [4,21,27]. A key hypothesis that has emerged from this literature is that CWE development generally results in higher local acceptance that is [at least partially] entwined with just processes and outcomes [13,28,29]. Further, some have added the nuance that social acceptance may depend on the stage of development, a graph in the shape of a U, such that local social acceptance of a project is high prior to a project proposal, lowest during development and construction and high again after locals have become habituated to living with turbines (but maybe not quite as high as pre-proposal)[30,31,32,33,34].

Further, the maturing of this 'social acceptance of wind energy' literature has been marked by a shift away from Not-In-My-Backyard (NIMBY) explanations - i.e. a highly criticized thesis, that locals opposing a wind energy project actually support the technology but selfishly prefer that it not be located near them [28,29,34]. The range of alternative explanations includes the expected advantages of community ownership/investment and participation in decision-making [13,21,22,35,36,37,38,39]. It is generally held that CWE has a high likelihood to be perceived as procedurally [2,40] and distributively just [4,41] for residents living close to turbines, and thus could theoretically, result in higher local acceptance. That said, not all projects that make a claim to being CWE achieve these positive outcomes in practice [42].

The assumption of positive associations between CWE projects and high social acceptance has been substantiated in academic research [3,13,40,43] and reified in policy documents [44,45,46]. That is, such governments in North America and across Europe have rolled out CWE programs in part to overcome the apparent decreasing local support for wind projects generally [4,13,40]. Nevertheless, the nuances of such community-based project outcomes are not well-understood [36,47]. Beneath the surface of favourable portrayal in academic and media discourses is the possibility that implementing CWE in any large-scale way remains an intractable "wicked problem" [48] despite progress. Case study research can help us better understand the problem of implementing CWE more extensively, if we are clear about what is being measured and how. When CWE is linked with high levels of local opposition, some have suggested it is it because developments projected as being grass-roots and community-based are not perceived as such by large portions of local stakeholders near turbines. As Walker & Devine-Wright [42 2662, see also 1] warn:

> *The rosy rhetorical image of close-knit rural communities must be subject to the realities of the fractures and disputes that can open up when people feel…they have been misled, that projects have been misrepresented…and that some people in the locality are either benefiting or being harmed in some way more than others.*

Walker & Devine-Wright [1] highlight two key tenets of what they call 'ideal' community renewable energy installations (including wind energy): i) facility planning and siting *process* (which can range from highly institutionalized and distant to very local and participatory), and ii) facility-related *outcomes* (both negative and positive, which can be focused on private investors or a collective) (see Figure 1). Although Walker & Devine-

Wright's intentions were to describe the broad range of energy projects, one inference that may be drawn from the framework is that participatory planning processes and benefits that are local and collective are the most in line with what community wind energy should look like. Under this conceptualization, we might also assume that those projects in the upper right quadrant of Figure 1 are more locally acceptable - "by and for local people" (p.498) - from the point of view that they best satisfy principles like procedural and distributive justice [2,40,49,50,52]. Creamer et al. [47] point out that describing social acceptance at the local level was not the explicit intention of the Walker & Devine-Wright framework, though many of us have interpreted it as such. However, there has been little systematic follow-up work to determine where cases purported to be CWE are positioned relative to what we are inferring to be this ideal upper-right quadrant. We extend the idea that the upper-right is ideal by assuming that it might also associated with higher levels of local community acceptance[1] something that requires more systematic empirical investigation. For example, is acceptance still high in the upper-left quadrant such that an open and participatory processes may be more sufficiently important relative to providing local, shared and collective financial benefits?

[1] In the study of renewable energy development, there are a variety of types of acceptance: public, market, political, and community (see [15,52]). Here, we focus on a fairly narrow spatially-oriented definition most akin to Wolsink's "community acceptance". We preface community acceptance with 'local' throughout this paper to emphasize that we are particularly interested in the views of those residents living closest to wind turbines. Operationally defining "local" varies (e.g. 2km to 10km or greater from turbines) and is treated in more detail below.

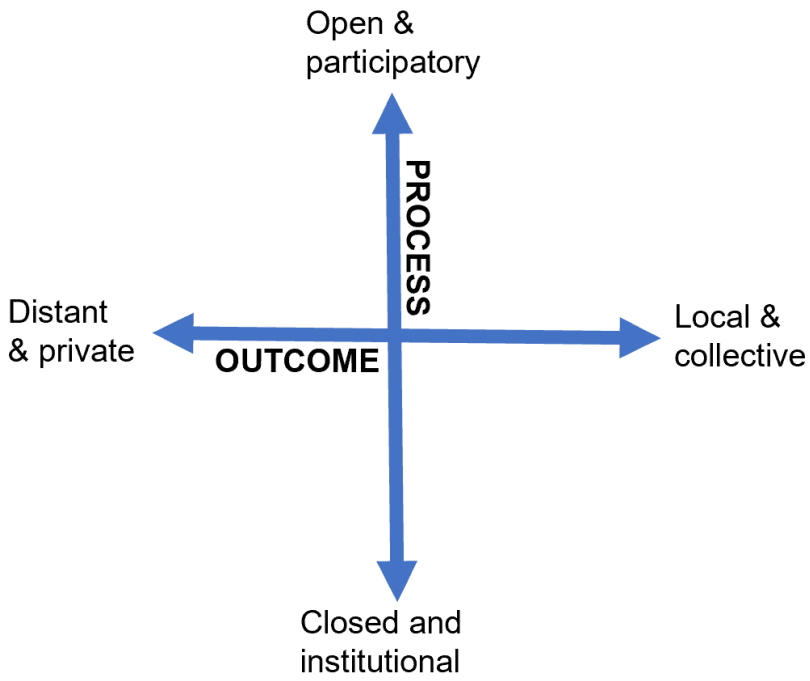

Figure 1: Conceptual dimensions of community renewable energy development (adapted from Walker & Devine-Wright [1])

The plurality of community wind energy discourses

This section highlights the plurality, and thus ambiguity, of CWE discourses as portrayed by academics. What is not well known is how that plurality plays out empirically when adopted by governments, developers and communities. If there is any skepticism about the merits of CWE, it seems to stem from an underwhelming delivery of promises in rural communities [3]. This can originate from conflicting discourses involving: the normative aspirations of CWE, the varied development models that lay claim to the CWE label, and the financial and institutional constraints in which they operate. The wide range of ideas about what CWE should look like leaves room for what Hicks and Ison [53] call 'charlatans' — developers who use the term as a superficial way to gain temporary social license without actually practicing what many academics envision and what local populations may desire [10,14,16,40,54].

An egregious example would be developers using the CWE label simply because energy output from a wind turbine development matches the level of consumption of the local population - regardless of whether the energy is actually used locally or how the facility siting processes played out [53]. Others have argued that when CWE lacks siting flexibility and adaptation to local contexts, there is a high risk of backlash from locals [55,56]. Indeed, the importance of local historical context is bound up in the concept of place - the notion that how locals are attached to the place they live, the meanings that are intertwined with the material world that surrounds them, frames how these residents respond to wind energy projects [57].

Research is not immune to the ambiguities around CWE; especially so where the mechanisms behind positive responses to community-based projects (e.g., participatory processes) are not detailed in reports on empirical findings. This absence of reporting may stem from a lack of coherence around CWE, which we take to encompass terms like ‘community-based’, ‘community-owned’ and ‘community-led’. We explore this issue here, within the constraint of that same lack of details about processes, outcomes and how they are intertwined in the case studies of wind energy projects in existing research. This reinforces our general urging of researchers to be more explicit about such matters when reporting empirical findings about CWE and social acceptance. For example, Berka & Creamer [36] highlight how most published works provide few details related to project profile and other local variables such as the socio-economic status of residents. These aspects may have implications for what might be the optimal model for

sharing financial benefits (e.g., ability to invest), and the ability to participate [37,58]. Furthermore, community-based wind energy projects are motivated by a wide range of objectives - e.g., environmental, social, financial or some combination thereof [36,59] — which may enthuse only certain segments of the local community.

The physical scale of a project — in terms of number and size of turbines — may also relate to how costs, benefits and thus acceptance are perceived. Smaller projects can be favoured for having minimal negative impacts and locally shared financial benefits; while larger industrial-scale projects can add significant cumulative impacts [60,61], yet simultaneously deliver both environmental and financial benefits (e.g., from investment) that extend to a much wider, even global, *spatial* scale. There may be high minimum investment thresholds in the thousands of dollars and therefore limited opportunities for locals to invest [53,58]. Harnmaijer et al. [62] remind that scale itself has different, thus potentially ambiguous, meanings in the renewable energy space including: the physical *size* of the project (height and number of turbines) and the *spatial extent* of the project (from local to regional to global) – whether those be investments, distributions of benefits/harms, or participation.

In terms of wind energy development, scale is also implied in the distinction between a “community of place” (geographically circumscribed group of people) and a “community of interest” (people with common goals like investing in wind energy bonds). Communities of interest are often diffuse and less likely to experience any significant acute (negative) impacts that may arise from wind energy projects, certainly not in the

same way locals would [63]. The difference between the two types of communities is a familiar conceptual distinction in critical thinking about renewable energy[2] [64,65,66]. For example, in a study of Italy's alternative energy transition, Magnani and Osti [67] argue that economic motivations driven by communities of interest predominate in discourses of energy transitions in the EU while discourses concerning communities of place (i.e. local communities) tend to be more muted or summarily dismissed in relation to the common good. Similarly, Bauwens' [37] research on community-based RE initiatives in Belgium reveals a trade-off between maintaining local social capital - a commitment to locality - and the benefits of 'scaling up' of capital and investment opportunities over larger geographic areas [68].

Thus, while the social acceptance of wind energy projects literature is conceptually rich, at the same time, there is a relatively untested assumption that CWE is a predictor of higher social acceptance -- without unpacking CWE to any great extent [47]. Our intention here is to more thoroughly match the theoretical with the empirical for CWE. Our goal is to enrich our understanding of the corpus of theory and findings, and equally importantly, set an agenda for designing future research and reporting on future case studies of CWE.

Questions to guide the review of empirical papers

[2] For a discussion on the many ways in which community is being used in carbon governance, including as actor, scale, place, network, process, and identity, see [65]. Here we focus on the two most commonly used in wind energy policy and development research: communities of place and interest.

We identify what CWE looks like in relation to the Walker & Devine-Wright [1] conceptual framework concerning process and outcome in Figure 1. We do this with the overall goal of identifying research opportunities, ones that extend beyond those suggested by recent allied reviews of community wind energy (e.g, [36,47,53]). Our analysis is guided by three interrelated research questions:

1) *How is CWE defined?*
2) *How do CWE empirical case studies relate to the Walker & Devine-Wright (2008) [1] framework concerning process and outcome?*
3) *What do the answers to 1) and 2) suggest for social acceptance of wind energy projects and future research and reporting?*

Thus, we extend recent reviews by Creamer et al. [47] and Berka & Creamer [36], who highlight a serious lack of academic attention given to fully understanding the outcomes of community energy projects. From there, we suggest that academics' ideas of CWE are not [necessarily] in step with what is practiced on the ground — a ground that is still, admittedly, rapidly shifting. Berka & Creamer [36] reveal large gaps in the literature, such as a lack of longitudinal studies, a tendency to focus on the downstream positive impacts (e.g. employment income, productivity, community resilience) and less on tracing the influence of upstream factors (e.g. planning and siting processes including local stakeholder engagement) on such outcomes. Though our analysis does concern the meaning of CWE, our analysis is grounded in recent empirical research which gets us closer to the question posed by Creamer et al. [47], "What does community renewable [e.g.,wind] energy *do*"? Specifically, we ask what CWE does for local

community acceptance of wind energy, and how it may be studied and re-conceptualized to further increase local acceptance.

Methodology

To advance an understanding of the ways in which CWE is defined and practiced - with particular reference to the Walker & Devine-Wright [1] framework and social acceptance - we conducted a review of case-study research on community-based wind energy development published from August 2008 to August 2018. This period starts in the year the landmark paper on CWE was published. We searched five comprehensive journal databases (Google Scholar, GEOBASE, Academic Search Complete, Environment Complete, and Proquest) using the Boolean terms “community” AND “wind energy” OR “wind turbine” OR “wind power” (i.e. across titles, main text, and keywords). These searches yielded more than 40,000 academic papers across the five databases. We then sorted by relevance and searched through the first 200 results in each database – the point beyond which relevance essentially dropped to zero. We then narrowed the list by title and abstract, to include only papers that are: (i) rooted in social science and (ii) related directly to CWE. Limiting papers to those published in the social sciences (e.g. human geography, environmental studies, psychology, economics, planning, sociology), eliminated mostly engineering and environmental science studies. Limiting our search to only wind energy research, eliminated studies focused on other renewable energy, but also non-renewable energy such as those concerned with coal, oil and gas development. After duplicates were removed, this resulted in a preliminary data set of 65 articles. Full-text reviews of each paper helped us narrow the dataset to include only

local case studies of wind energy which left 15 empirical papers for detailed analysis (Tables 1-3). The 50 of the 65[3] articles not deemed empirically relevant were nevertheless consulted to supplement the analysis and provide context. Table 1 provides methodological details of each article including: methods, the use of representative survey sampling, key questions asked about local community acceptance and the use of multivariate statistics. We do this here based on the calls for more transparency and detailed descriptions of methodology (e.g., [4,36]). Within this set of 15 empirical case-study journal articles, we performed full-text, inductive qualitative content and thematic analysis to address the research questions related to CWE. The vast majority of these studies involve communities living with turbines post-development, so the U-shaped hypothesis of social acceptance by project stage suggests that these communities would have a propensity towards higher social acceptance [30].

Table 1: Methodological summary of CWE empirical dataset (2008-2019) (n=15)

Papers Chronological	**Methods (n)**	**Mixed Methods Sequence[1]**	**Repre-sentative Survey Sample[2]**	**Key question(s) regarding local community acceptance**	**Multivariate regression analysis (significant predictors)[3]**
1) Bauwens & Devine-Wright (2018) [63]	Surveys (n=3963)	Not mixed	✘	If a wind turbine was erected in your direct neighbourhood (<5km) then your reaction would be...	✓ (Cooperative membership, pro-environment identity, social identification, gender, education, advice to join cooperative, low electricity price, democratic nature of cooperative, participation in general assemblies, rural/semi-rural)

[3] *Most papers were excluded because they did not explicitly study community wind energy projects per se rather associated ideas such as community benefits or public engagement. Others were excluded for lack of field measurement: e.g., discourse analyses (e.g.,[41]), policy reviews (e.g.,[69], hypothetical case studies (e.g.,[70]), or in the case of Rudolph et al. [71], "a study of case studies. Some papers were case studies/reviews of multiple renewable and/or sustainable energy technologies [42,55,63,72,73]. In these cases, we refer only to the community wind projects (i.e. via the introduction, methods, results and discussion surrounding community wind energy projects alone).*

2)	Haf & Parkhill (2017) [82]	Interviews (n=34)	Not mixed	N/A	N/A	✘
3)	Sperling (2017) [74]	Document analysis Interviews (n= 4)	Not mixed	✘	Reasons for success (including high local community acceptance)	✘
4)	Walker & Baxter (2017a) [4]	Interviews (n=54) Surveys (n=240)	Qual→ Quan	✓	I support the existing wind power project in my community	✓ (distribution of positive impacts, adequate compensation, more benefits to community needed, fund must be established to let some people 'escape')
5)	Walker & Baxter (2017b) [40]	Surveys (n=240) Interviews (n=54)	Qual→ Quan	✓	Index of "Overall I approve of the way wind energy development was planned and built in my community" and "I support the existing wind power project in my community"	✓ (ability to affect the outcome, wind energy as environmentally friendly, province, importance of electricity in my province, distance from turbine)
6)	Okkonen & Lehtonen (2016) [78]	Industry data & surveys (not given)	Not mixed	Unclear	N/A	✓ (N/A)
7)	Walsh (2016) [77]	Interviews (n=16)	Not mixed	✘	"local perceptions of a community wind farm"	✘
8)	Simcock (2014) [81]	Variety qualitative Interviews (n=53)	Not mixed	✘	How respondents felt about the [community] project…and its ownership structure	✘
9)	Yin (2013) [80]	Ethnographic interviews (n=12)	Not mixed	N/A	N/A	✘
10)	Bristow et al. (2012) [75]	Variety qualitative & quantitative Interviews (n=16)	Unclear	✘	N/A	✘
11)	Ferrer-Marti et al. (2012) [72]	Variety of qualitative & quantitative (not given)	Unclear	✓	Unclear	✘
12)	Munday et al. (2011) [73]	Variety qualitative & quantitative Interviews (n=14)	Unclear	✘	N/A	✘
13)	Musall & Kuik (2011) [76]	Surveys (n=200)	Not mixed	✓	"Does community ownership affect the acceptance of the local population?"	✘
14)	Warren & McFadyen (2010) [13]	Surveys (n=106) Interviews (n=5)	Quan→ Qual	✓	"Community ownership leads to greater [local] public acceptance"	✘
15)	Walker et al. (2010) [42]	Surveys (n=208) Interviews (n=56)	Unclear	Unclear	N/A	✘

[1] This column clarifies which method came first if mixed methods were used.
[2] Is representative sampling used for any part of the study? Not applicable "N/A" is indicated since most interview-based studies do not generally rely on representative (e.g., random) sampling, and instead tend to focus on specific stakeholder groups for the purposes of conceptual development
[3] In multi-stage regression modeling, we only report statistically significant factors for the final model that contains the most complete set of variables.

Results

The findings are organized according to the research questions. We first present the varied ways CWE is defined by researchers, both in terms of explicit definitions (if any) and in terms of the models of development they study (Q1)(Table 2[4]). We then describe how the CWE cases in the studies match with the Walker & Devine-Wright framework (Q2) (Figure 1, Table 2). The focus here is on depicted experiences of process, outcomes, and how these connect (if measured) to local social acceptance of community wind energy project (Q3). While we mention some implications for future research along the way in the Results (Q3), we deal with those more directly in the Discussion.

Q1: How is CWE defined?

A majority acknowledge that there is substantial diversity in the way 'community-wind/energy' is conceptualized and implemented. Some authors do not explicitly define the term [42,74,75,76], with Musall and Kuik [76] acknowledging a context of plurality — that CWE is, "not a clearly defined term [given that] different forms of community ownership exist in practice. Projects can be completely owned by a municipality or can be implemented in cooperation with private actors" (p. 3253). Others, including Walsh [77], more precisely frame their research using distinct categories of local ownership; in their case a threefold system: *community, cooperative* and *joint venture* (or owners, co-owners, or partners/stakeholders as in Okkonen [78]). Types of *community* ownership range widely - from 100% community-owned, to equity arrangements with individuals or

[4] We also include the type of community wind energy project(s) to give the reader a better sense of the relationship between the wind energy development and the local communities.

local councils [77]. *Cooperatives* are systems that "enable citizens to collectively own and manage projects at the local level…[with earning] usually divided" among members (Bauwens et al., [79], p. 136), while *joint ventures* require collaboration between a traditional developer and a community group [77]. Of course, even with these understandings in place, the problem with defining a community's relationship to a wind energy project is further complicated by the diversity and ambiguity in the way the term "community" is applied.

Table 2: Summary of definitions within CWE empirical dataset (2008-2018)

Papers Chronological	**Countries**	**Author Definition of "CWE"**	**Conceptualization of "community" (detail, if included)**	**Type of "community wind energy"**
1) Bauwens & Devine-Wright (2018) [63]	Belgium	Local communities lead, fully own, and share most of the benefits	Communities of interest or place (place as within 2km of a turbine)	Wind energy cooperative
2) Haf & Parkhill (2017) [82]	Scotland & Wales	Partly or fully owned by community	Communities of interest or place (active members and area residents)	Not clearly defined
3) Sperling (2017) [74]	Denmark	Not clearly defined	Never specifically Defined (n/a)	Variety of ownership models
4) Walker & Baxter (2017a) [4]	Canada	Majority ownership for those living closest to turbines	Communities of place (place as within 2km of a turbine)	Mostly developer-led with community/local investment opportunities
5) Walker & Baxter (2017b) [40]	Canada	Majority ownership for those living closest to turbines	Communities of place (place as within 2km of a turbine)	Mostly developer-led with community/local investment opportunities
6) Okkonen & Lehtonen (2016) [78]	Scotland	"a way to generate resources to be reinvested in local development…"	Communities of interest and/or place (Scottish Orkney, Shetland and Outer Hebrides isles)	Community development trusts
7) Walsh (2016) [77]	Ireland	High levels of local ownership, control and economic gains	Combination of interest and place ("community members")	Energy cooperative and 'wider community ownership'
8) Simcock (2014) [81]	UK	Decision-making and outcomes are local and collective	Communities of interest or place though most often as place ("vast	Cooperative and community trust

			majority" living in local civil parish)	
9) Yin (2013) [80]	USA	Local ownership and small size	Communities of place (anywhere in state of Oregon)	Variety of ownership models (none owned by local communities of place)
10) Bristow et al. (2012) [75]	Wales	Not clearly defined	Communities of interest and/or place (n/a)	Variety of ownership models
11) Ferrer-Marti et al. (2012) [72]	Peru	Sustenance projects	Communities of place (where energy is used)	Municipal-owned micro enterprise
12) Munday et al. (2011) [73]	Wales	Ownership or investment via equity or profit sharing	Communities of interest and/or place (n/a)	Variety of ownership models
13) Musall & Kuik (2011) [76]	Germany	Not clearly defined	Communities of interest and/or place	Hybrid (developer and community co-ownership)
14) Warren & McFadyen (2010) [13]	Scotland	Owned legally and psychologically by locals	hybrid of interest and place (not clearly defined)	Community-led and owned.
15) Walker et al. (2010) [42]	UK	"Quality of relationships between people and organizations that a part of the 'community'" is improved	Not clearly defined, acknowledge that the term can be problematic ("local stakeholders and...residents")	"Three local farmers" and a "committee-cooperative"

Bauwens and Devine-Wright [63] summarize much of the literature in suggesting that community, "can encompass a wide variety of meanings" (p. 613). Yet, they also acknowledge that being explicit about the conceptualization of community is fundamental for assessing who precisely is empowered by a community energy project (e.g., who leads or controls a project, who participates in decision making, and who reaps financial benefits) and who may be negatively impacted. There may be tensions between competing conceptions of who comprises a community.

Indeed, the importance of understanding who comprises the community in CWE was clearly mentioned by 12 of the 15 authors[5] (Table 2). Nevertheless, in nine of these studies, the authors stress that conceptions of community should be flexible — allowing for community as: (i) place (locality, or distance from turbines); and/or (ii) interest (e.g., a network of those interested in renewable energy broadly speaking). Such flexibility may be a limitation if it leads to ambiguity about things like participation, standing in the siting process, and sharing of costs and benefits. In particular, community of interest is spatially amorphous, while community of place is more precisely definable with reference to existing jurisdictions (e.g. census or voting districts) or linear distance.

In only four cases [4,40,72,80], did authors specifically identify community as being only a community of place. In two companion studies by Walker & Baxter [4,40] locality is stressed, in part, due to the way in which provincial policy was written and promoted to encourage local, community-driven development in Canada. The authors highlight the problems arising from having a high level of negative impacts within 2km of local turbines[6], while investors are sought from those living within the much wider-spatial scale municipality boundaries. Yin [80] shows how the community of interest as investors can readily expand to large-scale geographic areas, in his specific case, to the entire state of Oregon. That is, a community of investors may be less a community of defined geographic place and may be more a diffuse community of interest – those

[5] *Only in papers by Sperling [74] and Warren & McFadyen [13] did authors not define or at least explore meanings of community.*
[6] *Within the dataset, only the papers by Walker & Baxter [4,40] define community by such strict spatial boundaries.*

attracted to either low risk investment opportunities, the growth of green energy, or both. Ferrer-Marti et al. [72] likewise blend ideas of place and interest whereby their place-based cases in Peru are launched to help provide clean, reliable energy to a community of interest defined as underserved, poor local communities. The projects are municipally owned with energy and other benefits going specifically to a collective of marginalized groups. In Walker et al.'s [42] case study of Moel Moelogan wind farm historical context was also important. Most locals were critical of any form of CWE label for the turbines because it was a project owned by only three farmers, who "weren't born and bred" locally. Thus, while communities of place and communities of interest may intersect in many ways, context, history and geographic scale are also pertinent. Communities of interest – like potential investors - tend to be more diffuse covering large geographic scales: e.g., entire municipalities, or states/provinces; while communities of place – those living closest to the turbines – are the ones who bear the brunt of negative impacts of the facilities.

Q2: How do CWE studies relate to the Walker & Devine-Wright [1] framework concerning process and outcome?

In addition to explicit definitions of CWE, we parsed out any reference to Walker & Devine-Wright's framework that community-based energy may be defined along the two key dimensions of process and outcome (Figure 1, Table 3). As with our examination of community definitions broadly speaking, our analysis here likewise highlights the central role of geographic scale. Six of the studies specifically reference Walker & Devine-Wright's [1] two dimensions of process and outcome. For example, Walker & Baxter [40]

assert that community-based wind energy is, “a model for addressing both procedural and distributive fairness” (p.160). The others reference CWE as being characterized in one way or another by local populations leading/owning these projects while also experiencing most, if not all, of the (financial) benefits. Simcock [81] relies heavily on the writing of Walker & Devine-Wright (2008), and specifically references a continuum of private to CWE emphasizing the collective-to-private dimension of outcomes. Simcock [81] describes CWE as broadly comprising, “projects that have either or both decision process and project outcomes that are to some extent local and collective” (p. 241). Bauwens & Devine-Wright [63] similarly address both pillars in defining community initiatives as, “schemes in which local communities take the leading role in the development of projects, fully own the production assets, and capture most of the benefits” (p.613). They go on to mention that such development can be distinguished from community hybrid models, of shared ownership or utility-led development with community funding (i.e. voluntary payments to host communities or local governments).

Warren & McFadyen [13] meanwhile look to outcomes such as equitable distribution of local benefits and favourable perceptions of local planning to characterize community-led developments, while further suggesting a requirement that these projects be owned “(in both a legal and psychological sense) by local people” (p. 206). Among these papers, there seems to be a tacit, or even explicit, assumption that higher levels of local acceptance are driven by fairer process and outcomes when all are likewise locally focused. That is, the spatial scale of processes and outcomes is what matters – specifically, that they are locally fair. What the pattern of checkmarks suggests in Table

3 is that neither of the two dimensions seems sufficient on its own to garner majority local acceptance. That is, either there are all checkmarks across a row suggesting that facilities perceived to be just in terms of both process and outcomes also have majority local acceptance; or no checkmarks whereby projects are perceived to be unjust on both dimensions and locally unacceptable, with a few examples missing information in one or multiple cells.

Table 3: Process, outcome, and local acceptance from best-case examples[1] in CWE empirical dataset (2008-2018)

Papers (chronological)	**Majority local approval of *process*?**	**Majority local approval of *outcomes*?**	**Majority local community *acceptance*?**
1) Bauwens & Devine-Wright (2018) [63]	N/A	N/A	✓
2) Haf & Parkhill (2017) [82]	✓	✓	✓
3) Sperling (2017) [74]	✓	✓	✓
4) Walker & Baxter (2017a) [4]	✓	✓	✓
5) Walker & Baxter (2017b) [40]	✓	✓	✓
6) Okkonen & Lehtonen (2016) [78]	✘	✘	✘
7) Walsh (2016) [77]	N/A	✓	N/A
8) Simcock (2014) [81]	✓	✓	✓
9) Yin (2013) [80]	✘	✘	N/A
10) Bristow et al. (2012) [75]	✓	✓	N/A
11) Ferrer-Marti et al. (2012) [72]	✓	✓	✓
12) Munday et al. (2011) [73]	✓	✘	N/A
13) Musall & Kuik (2011) [76]	✓	✓	✓
14) Warren & McFadyen (2010) [13]	✓	✓	✓
15) Walker et al. (2010) [42]	✓	N/A	✓
TOTALS (% of reported)	11/15 (73%)	10/15 (67%)	10/15 (67%)

[1] - Though many of these empirical papers have multiple cases within them we focus here on the best example – the one furthest to the upper right as possible in the Walker & Devine-Wright [1] Figure.
[2] - Majority in each case is based on close reading of the paper, with particular reference to the findings section. Where it is not clear there was a majority in the paper, we indicate N/A. We did not contact the authors.

Using the findings from the process and outcomes columns in Table 3, we plotted where we interpret such CWE projects would lie on Walker & Devine-Wright's [1] two-

dimensional framework of community renewable energy (Figure 2). Most (9/12) articles (2-5,8,10,11,13,14) describe cases that fit in the top-right portion of the graph. Notable outliers include developments described by Yin [80](9) and Walsh [77](7), who write about case studies that fail to win local approval in terms of process and outcome, and Munday et al. [73](12), whose case study illustrates high approval of the process, diffusely distributed benefits without clear information about local acceptance.

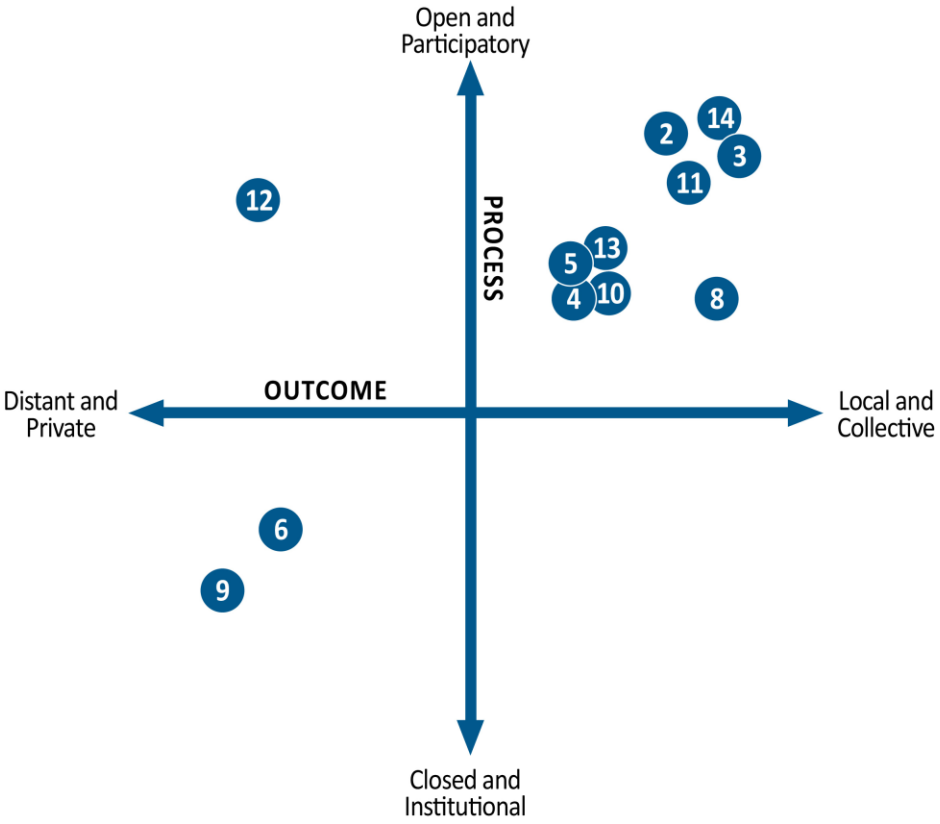

Figure 2: Placement of the CWE case studies on Walker & Devine-Wright's [1] conceptual dimensions of community renewable energy development (only those 12 of 15 studies where we could determine levels of approval in terms of local perceptions of process and outcomes are plotted)

We now turn more focused attention to how CWE is practiced by the communities and developers in the empirical studies (see Tables 2 & 3). Among the cases, four studies

refer to community of place alone, but not community of interest alone (n=0). Two others do not define community explicitly, while most (9/15) cases referred to both communities of place and communities of interest; further suggesting that when developments do so, they create the conditions that lead to high levels of local support. Musall & Kuik [76] help explain this trend of, “an overlap between a “community of interest” and a “community of locality [i.e. place]” as the way project proponents can expect, “enhanced acceptance in an area” (p.3253). Thus, as 13/15 papers discussed wind energy communities as place or place and interest, the lean towards locality may be a result of the planning process; whereby locals directly impacted by a development must be included in the process. According to Bristow et al. [75], the preference for community of place to play a prominent role may generally be because policy-makers and influencers find it convenient to define communities spatially as, “unproblematic and homogenous ‘communities of place’” (p.1109). Another reason may be that academics in this area focus considerable research attention on the negative impacts from turbines, which are generally spatially confined. The thinking often proceeds that such local directly affected populations should be the focus of offsetting financial and other benefits (e.g., through various forms of ownership) [81]. The empirical evidence suggests that a failure by wind energy proponents such as developers and state governments to appropriately acknowledge communities of place near turbines as directly impacted, is attended by a high risk of community concern and outright opposition. For example, in the study of an Irish wind farm, Walsh [77] finds that interviewees placed blame for a lack of clarity of what CWE means on the national government, who did not, “define ‘community’ for wind energy purposes in a functional

and operationally friendly manner" (p. 236). Similarly, local community opposition to the Moel Moellogan wind farm could be traced back to the way in which an uncertain understanding of community was, "strategically deployed... [and] politicised into public debate [42,p.2662].

In terms of process, most studies (11/15) told positive stories of local perceived procedural justice in CWE development. In one example, a study of Sleat (UK), Simcock [81] focuses on aspects of planning and siting processes. He suggests that what most strongly distinguished CWE from developer-led counterparts in Sleat was the strength of local participation and decision-making power. It was a form of grassroots "representative democracy" early in the stages of planning and siting:

> *"The direct decision to pursue the [wind energy project] was taken by the [Sleat Community Trust] board of directors, but its wider membership had the ability to elect this board of directors annually as a form of representative democracy." (p. 246)*

Other studies that outline developments perceived as having a greater degree of procedural justice include Sperling [74], who suggests that success was originally driven by a single community champion. Such a leader encouraged others towards, "broad local participation" through cooperative action, which in turn enabled the community to win a national energy competition that resulted in Samso being labelled the "Renewable Energy Island" in the UK. Sperling writes that a slow and purposeful approach to exploring the idea of CWE included, "processes of sensing and priming in order to achieve successful meetings" (p.894). Great attention was committed by proponents to

the feelings, opinions and interests of the local population an inclusive process that readily adapted to changing contextual conditions.

In only a minority of case studies (2/15) was there clear evidence of unsatisfactory CWE planning and siting processes [77,80]. Most often perceptions of procedural injustice were born out of disappointing planning and outcome experiences compared with the promise and allure of CWE [77]. The CWE development in Walsh's study was operationalized as being just 24 local landowners who had any real investment or control — something seen by other locals as insufficiently collective to deserve the title of CWE (see also [42]). Although all other locals were welcome to take part in consultation, such events were held after final decisions about major financial benefits distribution had already been made. One resident summed up their concerns by calling the project "callously capitalistic". Another who lived within 1km of a least five turbines said plans were not transparent and "[they] were lucky to hear [about the project] in time to submit on objection". This type of process created a divided community and, "a great deal of distress", among residents (p. 235).

A common theme in the empirical accounts is that benefits helped to define CWE in practice – a key aspect of the outcome dimension in the Walker & Devine-Wright [1] framework. The most common positive impacts seen in these communities related to local jobs, new sources of income, and revenue that was then used in community investment projects. Haf & Parkhill [82] show that CWE projects have the potential to rejuvenate rural areas that may have been broken by economic marginalization and

population decline. We refer to this as the historical context of renewable energy transitions – the central tenet being that some communities are more open to renewable energy development because of how their local history is embedded in wider social, economic and policy contexts (see also [47]). Thus, Warren & McFadyen's [13] study of community and developer-owned wind energy projects in south-west Scotland is reminiscent of the findings by Haf & Parkhill [82]. In the former example wide spread local acceptance in their CWE case example relates to the community taking ownership of the project on Gigha [Isle] which, "led to a renaissance involving job creation, in-migration and growing numbers in the local school" (p. 210; see also [72, 73]).

A handful of the studies detail positive attitudes of locals including local feelings of pride [74], progress [72,82] and the idea that CWE strengthens the social bonds within local populations [13]. Bristow et al. [75] write about how CWE development in the UK helped to break down invisible barriers between Indigenous populations and incomers. With reference to what they call, "communitarian benefits", Haf & Parkhill [82] suggest that the wind energy development created such a strong sense of local pride that the community went forward with a traditionally Dutch exercise of naming of the "windmills" (turbines), Creideas (Faith), Dòchas (Hope) and Carthannas (Charity) — also known as the "The Three Dancing Ladies". These examples remind us that local transition to hosting renewable energy does not happen in a vacuum, rather; it happens when global/national interests align with local interests such that the time is right for turbines.

The most common model where process and outcome went hand-in-hand was the cooperative model. Cooperatives most commonly allow a percentage of community investment from individual residents (sometimes to a majority level of 51% or more). With reference to what is seen as a successful cooperative project on the Isle of Gigha, owned 100% by a community financial trust, Bauwens & Devine-Wright [63] report on the role of interpersonal trust and eschewing hierarchies:

> *"Characteristics of the cooperative model are consistent with the finding that horizontal networks, where people have equivalent status and power, engender trust because they facilitate exchanges of information, whereas hierarchies tend to inhibit information flows due to asymmetric power relationships" (p. 614)*

Six of the case studies make specific reference to community investment at fairly low, or ostensibly affordable minimums [4,40,53,63,75,81]. In Ontario, Canada, this meant investment started at $1000 CAD [4]. Developers interviewed said this level was purposeful to allow anyone to say, "Yeah…I want to be part of that" (p. 762). Meanwhile, in Australia [53] and in the UK [75] projects have required an even more modest minimum investment of just $100 (AUD) and 100 Euros, respectively. In practice though, investment from locals was sometimes lower than expected despite the purported affordability. Though not a major point of our inquiry into the 15 papers, this is certainly fertile ground for future research whereby terms like affordability and investment opportunities are defined and measured more precisely, particularly in survey work.

Discussion

This analysis of empirical research helps add conceptual clarity and suggest directions for future research on community wind energy. In particular, we have highlighted the integral role of the geographic spatial scale of investment, the local historical context of energy transitions, as well as the need to more explicitly measure local perceptions of: i) processes and outcomes as per Walker & Devine-Wright [1] (Figures 1, 2) as well as; ii) levels of local community acceptance [31].

Q2 and Q3: Transforming Walker & Devine-Wright for understanding social acceptance

a) Justice from process, benefits and investment scale

Figure 3 is inspired but the Walker & Devine-Wright [1] framework and focuses attention on three dimensions that we posit contribute to high local social acceptance of wind energy, that projects be: locally-oriented, participatory and collective. While these dimensions do not necessarily entirely define CWE, they may be pivotal for maximizing local support for CWE. The investment scale dimension is a new, while taken the existing “outcome” dimension from Walker & Devine-Wright parsed it out into “benefit” and “negative impacts” (costs), to distinguish that these need to be considered separately, not least of which because of the scalar implications. The images of the turbine and house at the origin reminds us that, notwithstanding concerns about aesthetic changes to the landscape felt by wider publics (e.g., regional residents, tourists), most costs in the form of ongoing negative externalities (e.g., noise, shadow flicker) are felt locally. Benefits tend to be less localized, and regardless of spatial scale,

they may be collective (e.g., a public cooperative community of shared interest in local economic development and/or carbon reduction) or private (anonymous investors or landowners mainly intending to make a profit). While mitigating negative externalities (costs) for locals is extremely important, and not just for social acceptance reasons; those externalities are represented by curved text at the origin rather than a vector. In terms of financial costs, Rand & Hoen [21] isolate a table of economic impact concerns residents express about wind turbine developments (e.g., house value) in their 30-year retrospective, and with the exception of impacts on electricity prices, those impacts are all local. However, because the distribution of benefits generally happens at multiple scales and is intimately linked to concerns about distributive justice, it is represented separately by a vector depicting an open, collective distribution of benefits at the origin with an outward trajectory towards benefits that are not publicly known and potentially more diffuse. For example, profits to private investors who may not even know their money comes from the turbines (e.g., diversified investment portfolios) would be furthest from the origin. Though just arrangements may still involve some of the profits going to distant private, anonymous investors, the greater the local, transparent, sharing of benefits, the greater the perception of justice by locals [4].

Unlike Walker & Devine-Wright's [1] four quadrant framework – with the upper right generally viewed as being the 'ideal' area, which we argue should garner high social acceptance (see Figure 1) – we focus on the local as the origin in Figure 3. Thus, looking outwards from the origin along the process axis moves us towards less participatory decision making (closed, institutionalized); along the benefits axis from

collective to private and; along the scale of investment axis from local to global[7]. In this reconceptualization, any project that moves outward from the origin is expected to be at greater risk of lower local social acceptance [42,76,77 80].

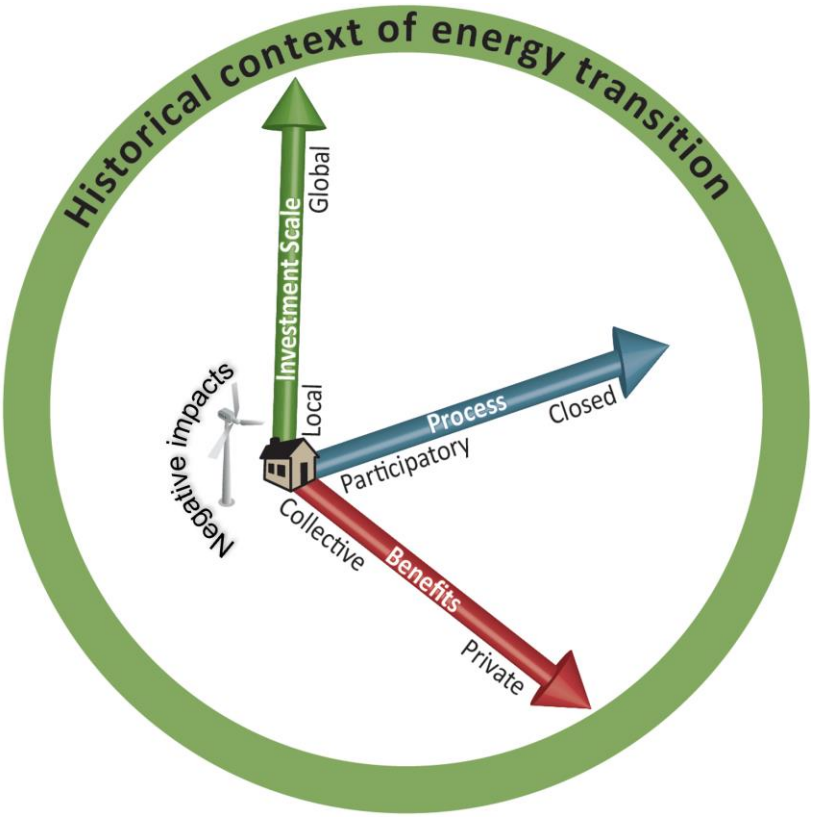

Figure 3: Reconceptualization of key dimensions of local community wind energy acceptance: Benefits, process and investment scale

b) Justice in the local historical context and social acceptance

In terms of the developments themselves, ones that had localized and spatially compact procedural justice and benefits sharing (i.e. spatial place/locality) seemed to have the

[7] Though not included as part of the model in Figure 3, researchers might also consider "scale" as the size of the project (few and relatively small turbines) to large scale projects (10s to 100s of large turbines). Scale is used in different ways throughout the literature including – geographic spatial extent, size of turbines, and number of turbines - and we encourage precise definition whenever the term is used.

highest levels of local community acceptance. In fact, the highest levels of local acceptance identified in the 15 studies usually described how community of place and community of interest coincided — e.g., the two European island examples of Gigha and Samso [13,74]. In both places, success was driven by careful, community-driven procedures for siting wind turbines, attention to the fair distribution of benefits within the local populations as well as community historical contexts ripe for economic and social change. Such an approach was locally-centred from the beginning, which helped to grow a relatively supportive and accepting localized community of interest.

The local historical context of energy transition often relates to the “why” of high local community acceptance correlating with CWE projects, yet that relationship remains amorphous in terms of evidence-based decision-making. Which contextual factors are most and least important for garnering high local acceptance with CWE? Historical context and place matter, suggesting idiographic explanations that may not be entirely replicable — e.g., charismatic leaders and champions [57,74]. We concur that there are processes and outcomes that have high impact — beyond simply calling a project CWE — yet we also need to explore nomothetic explanations that transcend place. The external and internal factors that led to successful implementation and management of wind energy in Denmark, for example may not, on first blush, seem readily transferable, and may not even have the same impact on communities elsewhere. For example, Sperling [74] suggests that the success of the Samso project is in part related to, “the long Danish tradition of local cooperatives owning and running local production infrastructure” (p. 886), while in other cases transitions away from coal or nuclear may

be relevant [15]. Thus, while Creamer et al. [47] urge that CWE research must be, “alive to context”, there may be commonalities across places. Places with stronger histories in local large-scale development or in need of economic uplift, may more readily make move to community-based ownership of turbines.

Thus, as Ellis & Ferraro [22] remind, local acceptance is embedded within larger energy transition structures – hence, the outer circle in Figure 3. For example, in the Canadian context, Stefanelli et al. [83] write about the potential for community renewable energy to increase well-being in Indigenous communities. Yet, while their core explanatory concepts relate to historical context – e.g., post-colonial reconciliation and environmental repossession - such concepts may readily be mapped onto the other concepts in Figure 3: investment, procedural and benefits issues. For example, financial independence and decision-making sovereignty relate respectively to benefits-related distributive justice and procedural justice.

Q3: Implications for research

From an empirical research standpoint, we might further explore necessary and sufficient dimensions in Figure 3, such that high satisfaction with one or two dimensions may be sufficient to garner high local acceptance. It may be that a small project near homes, despite being low on one measure of collective benefit and local investment (e.g., less than 49% local equity stake) has high local acceptance because that minority ownership itself is distributed fairly (collectively) in the local context and the process for decision-making remains highly participatory. In this sense principles of procedural and

[enough] distributive justice are met despite a controlling 51% developer investment stake [4]. Alternately there could be high acceptance of a large project involving 100s of turbines nearby homes with people who are highly satisfied with their level of participation in the planning and siting process and who share collectively by investing and benefiting from multiple types of community benefits (e.g., parks, libraries) from the project. That said, we must be mindful of the fact that all three of these vectors, as with the two axes in Walker & Devine-Wright's [1] Figure 1 are "entangled" in various ways with each other such that it may be difficult to separate benefits from investments from procedural, scale and contextual issues [47]. Researchers might consider creative (e.g., longitudinal) research designs to disentangle these dimensions to determine if one is a keystone affecting all others (e.g., local participatory process).

For example, from a procedural standpoint, knowing there are cooperative investment opportunities for the public is insufficient for local support, particularly when investors come from long distances [81] or too few locals are invested [42,77]. Future research might specifically measure actual local and non-local investment in turbine projects using secondary data from wind energy developers/planning authorities. Researchers might also use primary data collection methods (e.g., surveys, interviews) to understand the reasons for investing or not investing [36]; both locally and extra-locally to facilitate scalar comparisons. In this sense scale is as relevant as "community", with scale ostensibly being much more straightforward to operationally define as distance from a wind energy development.

As scale refers to multiple phenomena in the literature researchers need to be precise about how they are defining it. Though it may mean the size of the development (size and number of turbines) or the spatial area over which investment, decision-making power and benefits are distributed – we focus on the latter, the spatial extent of investment since that more tightly encompasses both decision-making and benefits. This reinforces a hybrid vision of community in relation to CWE projects such that households within n meters of a turbine may represent a community of place/locality and a community of interest who shares the negative externalities and positive benefits of the project [13].

Thus, scale may help bridge the community of place — community of interest dualism which further ties into the local historical context of energy transitions. Walker & Devine-Wright [1] do indeed point out the importance of scale implicitly in Figure 1, while what we are suggesting is to elevate the status of both scale and historical context conceptually so that they appear explicitly in research. The advantage, as Hicks & lson [53] point out, is that attention to scale and context helps us push past the status quo of CWE being ill-defined, “there is a risk that ‘business as usual’ development…is branded [as CWE] without leading to the type of community processes and outcomes that proponents and policy makers expect” (p. 524). Focusing attention on the local scale in relation to all others (e.g., regional, state, global), provides a more consistent framing of CWE, so that researchers and stakeholders can be more precise about what conditions lead to high (and low) local acceptance of an ostensible CWE project.

Though setback distances between turbines and the nearest home vary from one jurisdiction to the next, defining what is local and non-local for the purposes of research need not be arbitrary [85]. There is some guidance in the empirical literature whereby researchers are explicit about the rationales for zones for measurement (e.g., respondent subsamples). There need not be a standardized zone defined as being "local". Yet, explicitly defining such zones at least establishes a basis for comparison. For example, Walker et al [86] use 2km from the nearest turbine as their measure, the rationale being that community groups opposed to turbine developments in the jurisdiction they were studying (Ontario, Canada) were suggesting 2 km as the appropriate setback distance in provincial-level policy disputes. Though we must be mindful that when we do so distances between study participants and the turbines can still vary substantially [76]. Researchers are urged to provide further context by being more explicit about the spatial juxtaposition of the sample community for study and the turbines. If there is a relatively large distance (e.g., 15 km) between the study participants and the turbines, such should be reported as this can dramatically influence how readers interpret findings [16]. When researchers focus on the community of interest alone and/or are vague about where participants live relative to the turbines, we are apt to make too many assumptions about how locals closest to the turbines are responding to the project [77,81,82]. We suggest that those living closest are among those who most vigorously oppose and halt turbine developments [4,40,87,88]. That said, we also know that those living close by are also among the most supportive [89,90,91]. Thus, we recognize how the linkage between distance and attitude is not entirely clear, likely context-dependent, and in need of further empirical investigation.

As with investment depicted in Figure 3, scale is likewise relevant when thinking about how social acceptance happens or erodes. That is, developers and governments may remain cagey about CWE being based on a community of place (locality) where in fact the owners are a community of interest on a much wider scale than those within a few kilometers of the turbines. Two poignant examples can be found in Nova Scotia's approach to CWE in Canada [4,40], and Yin's [80] description of [state-wide] community ownership from Oregon. In both cases locals identified procedural and outcomes deficiencies that were implicitly scalar — e.g., lack of meaningful local participation in investment and decision-making about the turbines.

We suggest pushing past assumptions about CWE as, "romanticised and quiescent phenomenon characterized by consensus, shared interests and collaborative strategies" [75,p.1109], at the same time we resist any urge to retreat to relativism by assuming that every context for CWE is unique. We need more studies that examine local residents' views on the key dimensions in Figures 1 and 3 directly and ones that engage locals at different stages in the development process [30]. In some studies authors set up CWE projects as diametrically opposed to corporate development strategies, which unintentionally obfuscates by giving us little sense of the actual procedures and outcomes which are most effective. We do know that CWE is *generally* more highly correlated with local acceptance of turbines, so now is the time to focus more precisely on teasing out why that is the case. As Bauwens and Devine-Wright [63] suggest, 10 years after Walker & Devine-Wright's [1] landmark conceptual piece, there still needs to

be more comparative research looking at the details of process and outcome. We concur, highlighting that we might also study the roles of (investment) scale and the historical context of energy transitions. Studying single cases of CWE in before-after designs is as important as continuing to use cross-sectional designs that compare CWE with other models and; in both cases we should study a wide variety development models at different stages in the process.

The relatively rare failures of CWE in the case examples [77,80], highlight that, in the absence of due attention to justice at the local scale, superficially calling a project CWE can spiral negative sentiment towards a project and perhaps its demise, Thus, Bauwens and Devine-Wright [63] call for more qualitative research to tease out the reason behind what they call “midpoint responses” in local communities, ostensible acceptance in the form of ambivalence to local wind energy development. Walker and Baxter [4] point out the need for more research in contexts where only a small portion of the local population knows about, let alone actually invests in (when available), projects identified by developers as CWE.

Conclusion

While there is little doubt that community-based wind energy development (CWE) is associated with relatively higher levels of community acceptance future research can do much to untangle *why*. This analysis of empirical case studies highlights how we might more thoroughly measure features of CWE in the real world to better understand the most impactful processes and outcomes. We shed light on the roles of investment

scale, benefits distribution and the local historical context of energy transitions to continue expanding our frameworks for future study of social acceptance of wind energy. We suggest that case studies more clearly articulate these aspects so that academics can draw clearer comparisons and developers and policy makers have a firmer basis for decision-making.

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REFERENCES

1. Walker, G., & Devine-Wright, P. (2008). Community renewable energy: What should it mean?. *Energy policy*, *36*(2), 497-500.

2. Gross, C. (2007). Community perspectives of wind energy in Australia: The application of a justice and community fairness framework to increase social acceptance. *Energy policy*, *35*(5), 2727-2736.

3. Simcock, N. (2016). Procedural justice and the implementation of community wind energy projects: A case study from South Yorkshire, UK. *Land Use Policy*, *59*, 467-477.

4. Walker, C., & Baxter, J. (2017a). "It's easy to throw rocks at a corporation": wind energy development and distributive justice in Canada. *Journal of Environmental Policy & Planning*, 1-15.

5. Community Power (2019) Community power for people's ownership of renewable energy, Retrieved on May 2, 2019 from: https://www.communitypower.eu/en/

6. Scottish Government (2019) *Local and Small-scale Renewables*, Retrieved on July 1, 2019 from: https://www.gov.scot/policies/renewable-and-low-carbon-energy/local-and-small-scale-renewables/

7. TREC (2019). The power of community: How community-owned renewable energy can help Ontario create a powerful economic advantage, retrieved on May 2, 2019 from: http://www.trec.on.ca/report/the-power-of-community/

8. Haggett, C., & Aitken, M. (2015). Grassroots energy innovations: The role of community ownership and investment. *Current Sustainable/Renewable Energy Reports*, *2*(3), 98-104.

9. Wirth, S. (2014). Communities matter: Institutional preconditions for community renewable energy. *Energy Policy*, *70*, 236-246.

10. Rogers, J. C., Simmons, E. A., Convery, I., & Weatherall, A. (2012). What factors enable community leadership of renewable energy projects? Lessons from a woodfuel heating initiative. *Local Economy*, *27*(2), 209-222.

11. Peters, M., Fudge, S., & Sinclair, P. (2010). Mobilising community action towards a low-carbon future: Opportunities and challenges for local government in the UK. *Energy Policy*, *38*(12), 7596-7603.

12. Walker, G., Hunter, S., Devine-Wright, P., Evans, B., & Fay, H. (2007). Harnessing community energies: explaining and evaluating community-based localism in renewable energy policy in the UK. *Global Environmental Politics*, *7*(2), 64-82.

13. Warren, C. R., & McFadyen, M. (2010). Does community ownership affect public attitudes to wind energy? A case study from south-west Scotland. *Land use policy*, *27*(2), 204-213.

14. Hoffman, S. M., & High-Pippert, A. (2010). From private lives to collective action: Recruitment and participation incentives for a community energy program. *Energy Policy*, *38*(12), 7567-7574.

15. Walker, C., Stephenson, L., & Baxter, J. (2018). “His main platform is ‘stop the turbines’”: Political discourse, partisanship and local responses to wind energy in Canada. *Energy policy*, *123*, 670-681.

16. Baxter, J., Morzaria, R., & Hirsch, R. (2013). A case-control study of support/opposition to wind turbines: Perceptions of health risk, economic benefits, and community conflict. *Energy Policy*, *61*, 931-943.

17. Brown, K. B. (2011). Wind power in northeastern Brazil: Local burdens, regional benefits and growing opposition. *Climate and Development*, *3*(4), 344-360.

18. Colvin, R. M., Witt, G. B., Lacey, J., & Witt, K. (2019). The community cost of consultation: Characterising the qualitative social impacts of a wind energy development that failed to proceed in Tasmania, Australia. *Environmental Impact Assessment Review*, *77*, 40-48.

19. Fournis, Y. and Fortin, M.J., 2017. From social ‘acceptance’to social ‘acceptability’of wind energy projects: towards a territorial perspective. *Journal of environmental planning and management*, *60*(1),1-21.

20. Lennon, M., & Scott, M. (2015). Contending Expertise: An Interpretive Approach to (Re) conceiving Wind Power's ‘Planning Problem’. *Journal of Environmental Policy & Planning*, *17*(5), 593-616.

21. Rand, J., & Hoen, B. (2017). Thirty years of North American wind energy acceptance research: What have we learned?. *Energy Research & Social Science*, *29*, 135-148.

22. Ellis, G., & Ferraro, G. (2016). The social acceptance of wind energy. *Where we stand and the path ahead. JRC Science for policy report. European Commission, Brussels*.

23. Ellis, G., Barry, J., & Robinson, C. (2007). Many ways to say ‘no’, different ways to say ‘yes’: applying Q-methodology to understand public acceptance of wind farm proposals. *Journal of environmental planning and management*, *50*(4), 517-551.

24. Jobert, A., Laborgne, P., & Mimler, S. (2007). Local acceptance of wind energy: Factors of success identified in French and German case studies. *Energy policy*, *35*(5), 2751-2760.

25. Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy policy*, *35*(5), 2683-2691.

26. Wolsink, M. (2000). Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support. *Renewable energy*, *21*(1), 49-64.

27. Jepson, W., Brannstrom, C., & Persons, N. (2012). “We Don’t Take the Pledge”: Environmentality and environmental skepticism at the epicenter of US wind energy development. *Geoforum*, 43(4), 851-863.

28. Kaldellis, J. K. (2005). Social attitude towards wind energy applications in Greece. *Energy Policy*, 33(5), 595-602.

29. Kahn, R. D. (2000). Siting struggles: the unique challenge of permitting renewable energy power plants. *The Electricity Journal*, 13(2), 21-33.

30. Wilson, G. A., & Dyke, S. L. (2016). Pre-and post-installation community perceptions of wind farm projects: the case of Roskrow Barton (Cornwall, UK). *Land Use Policy*, 52, 287-296.

31. Wolsink, M., 2007. Planning of renewables schemes: Deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. *Energy policy*, *35*(5), pp.2692-2704.

32. Devine-Wright, P. (2005). Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy. Wind Energy: An International *Journal for Progress and Applications in Wind Power Conversion Technology*, 8(2), 125-139.

33. Krohn, S., & Damborg, S. (1999). On public attitudes towards wind power. *Renewable energy*, *16*(1-4), 954-960.

34. Gipe, P. (1995). *Wind energy comes of age* (Vol. 4). John Wiley & Sons.

35. Devine-Wright, P. (Ed.). (2014). *Renewable Energy and the Public: from NIMBY to Participation*. Routledge.

36. Berka, A. L., & Creamer, E. (2017). Taking stock of the local impacts of community owned renewable energy: A review and research agenda. *Renewable and Sustainable Energy Reviews*.

37. Bauwens, T. (2016). Explaining the diversity of motivations behind community renewable energy. *Energy Policy*, *93*, 278-290.

38. Heiskanen, E., Johnson, M., Robinson, S., Vadovics, E., & Saastamoinen, M. (2010). Low-carbon communities as a context for individual behavioural change. *Energy Policy*, *38*(12), 7586-7595.

39. Levitas, R. (2000). Community, utopia and new labour. *Local Economy*, *15*(3), 188-197.

40. Walker, C., & Baxter, J. (2017b). Procedural justice in Canadian wind energy development: A comparison of community-based and technocratic siting processes. *Energy Research & Social Science*, *29*, 160-169.

41. Cowell, R., Bristow, G., & Munday, M. (2011). Acceptance, acceptability and environmental justice: the role of community benefits in wind energy development. *Journal of Environmental Planning and Management*, *54*(4), 539-557.

42. Walker, G., Devine-Wright, P., Hunter, S., High, H., & Evans, B. (2010). Trust and community: Exploring the meanings, contexts and dynamics of community renewable energy. *Energy Policy*, *38*(6), 2655-2663.

43. Nolden, C. (2013). Governing community energy—Feed-in tariffs and the development of community wind energy schemes in the United Kingdom and Germany. *Energy Policy*, *63*, 543-552.

44. Government of Nova Scotia, COMFIT, retrieved on Dec 16, 2019 from: https://energy.novascotia.ca/renewables/programs-and-projects/comfit

45. Government of Ireland (2015) White paper: Ireland's Transition to a Low Carbon Energy Future, https://www.dccae.gov.ie/documents/Energy%20White%20Paper%20-%20Dec%202015.pdf

46. Government of the United Kingdom (2019), Community Energy, retrieved on Dec. 15, 2019 from: https://www.gov.uk/guidance/community-energy

47. Creamer, E., Aiken, G.T., & van Veelan, B., Walker, G., & Devine-Wright, P. (2019) Community renewable energy: What does it do? Walker and Devine-Wright (2008) ten years on, *Energy Research and Social Science, 57,* 101223.

48. Rittel, H. W., & Webber, M. M. (1974). Wicked problems. *Man-made Futures*, *26*(1), 272-280.

49. Gorayeb, A., Brannstrom, C., de Andrade Meireles, A. J., & de Sousa Mendes, J. (2018). Wind power gone bad: Critiquing wind power planning processes in northeastern Brazil. *Energy research & social science*, *40*, 82-88.

50. Friedl, C., & Reichl, J. (2016). Realizing energy infrastructure projects–A qualitative empirical analysis of local practices to address social acceptance. *Energy Policy*, *89*, 184-193.

51. Walter, G. (2014). Determining the local acceptance of wind energy projects in Switzerland: the importance of general attitudes and project characteristics. *Energy Research & Social Science*, *4*, 78-88.

52. Wolsink, M. (2018). Co-production in distributed generation: renewable energy and creating space for fitting infrastructure within landscapes. *Landscape research*, *43*(4), 542-561.

53. Hicks, J., & Ison, N. (2018). An exploration of the boundaries of 'community' in community renewable energy projects: Navigating between motivations and context. *Energy Policy*, *113*, 523-534.

54. Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., & Smith, A. (2014). A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions*, *13*, 21-44.

55. van Veelen, B. (2017). Making sense of the Scottish community energy sector–an organising typology. *Scottish Geographical Journal*, *133*(1), 1-20.

56. Bird, C., & Barnes, J. (2014). Scaling up community activism: the role of intermediaries in collective approaches to community energy. *People, Place & Policy Online*, *8*(3).

57. Devine-Wright, P., & Howes, Y. (2010). Disruption to place attachment and the protection of restorative environments: A wind energy case study. *Journal of environmental psychology*, 30(3), 271-280.

58. Strachan, P. A., Cowell, R., Ellis, G., Sherry-Brennan, F., & Toke, D. (2015). Promoting community renewable energy in a corporate energy world. *Sustainable development*, *23*(2), 96-109.

59. Mey, F., Diesendorf, M., & MacGill, I. (2016). Can local government play a greater role for community renewable energy? A case study from Australia. *Energy Research & Social Science*, *21*, 33-43.

60. Ladenburg, J., Termansen, M., & Hasler, B. (2013). Assessing acceptability of two onshore wind power development schemes: A test of viewshed effects and the cumulative effects of wind turbines. *Energy*, *54*, 45-54.

61. Walker, B. J., Wiersma, B., & Bailey, E. (2014). Community benefits, framing and the social acceptance of offshore wind farms: an experimental study in England. *Energy Research & Social Science*, *3*, 46-54.

62. Harnmeijer, J., Parsons, M., & Julian, C. (2013). The Community Renewables Economy. *ResPublica/RenewableUK*.

63. Bauwens, T., & Devine-Wright, P. (2018). Positive energies? An empirical study of community energy participation and attitudes to renewable energy. *Energy Policy*, *118*, 612-625.

64. Aiken, G. (2012). Community transitions to low carbon futures in the transition towns network (TTN). *Geography Compass*, *6*(2), 89-99.

65. Walker, G. (2011). The role for 'community' in carbon governance. *Wiley Interdisciplinary Reviews: Climate Change*, 2(5), 777-782.

66. Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, *30*(1), 1-10.

67. Magnani, N., & Osti, G. (2016). Does civil society matter? Challenges and strategies of grassroots initiatives in Italy's energy transition. *Energy Research & Social Science*, *13*, 148-157.

68. Smith, A., Hargreaves, T., Hielscher, S., Martiskainen, M., & Seyfang, G. (2016). Making the most of community energies: Three perspectives on grassroots innovation. *Environment and Planning A*, *48*(2), 407-432.

69. Fischlein, M., Larson, J., Hall, D. M., Chaudhry, R., Peterson, T. R., Stephens, J. C., & Wilson, E. J. (2010). Policy stakeholders and deployment of wind power in the sub-national context: A comparison of four US states. *Energy Policy*, *38*(8), 4429-4439.

70. Johansen, K., & Emborg, J. (2018). Wind farm acceptance for sale? Evidence from the Danish wind farm co-ownership scheme. *Energy Policy*, *117*, 413-422.

71. Rudolph, D., Kirkegaard, J., Lyhne, I., Clausen, N. E., & Kørnøv, L. (2017). Spoiled darkness? Sense of place and annoyance over obstruction lights from the world's largest wind turbine test centre in Denmark. *Energy research & social science*, *25*, 80-90.

72. Ferrer-Martí, L., Garwood, A., Chiroque, J., Ramirez, B., Marcelo, O., Garfí, M., & Velo, E. (2012). Evaluating and comparing three community small-scale wind electrification projects. *Renewable and Sustainable Energy Reviews*, *16*(7), 5379-5390.

73. Munday, M., Bristow, G., & Cowell, R. (2011). Wind farms in rural areas: How far do community benefits from wind farms represent a local economic development opportunity?. *Journal of Rural Studies*, *27*(1), 1-12.

74. Sperling, K. (2017). How does a pioneer community energy project succeed in practice? The case of the Samsø Renewable Energy Island. *Renewable and Sustainable Energy Reviews*, *71*, 884-897.

75. Bristow, G., Cowell, R., & Munday, M. (2012). Windfalls for whom? The evolving notion of 'community' in community benefit provisions from wind farms. *Geoforum*, *43*(6), 1108-1120.

76. Musall, F. D., & Kuik, O. (2011). Local acceptance of renewable energy—A case study from southeast Germany. *Energy Policy*, *39*(6), 3252-3260.

77. Walsh, B. (2016). Community: a powerful label? Connecting wind energy to rural Ireland. *Community Development Journal*, *53*(2), 228-245.

78. Okkonen, L., & Lehtonen, O. (2016). Socio-economic impacts of community wind power projects in Northern Scotland. *Renewable Energy*, *85*, 826-833.

79. Bauwens, T., Gotchev, B., & Holstenkamp, L. (2016). What drives the development of community energy in Europe? The case of wind power cooperatives. *Energy Research & Social Science*, *13*, 136-147.

80. Yin, Y. (2013). An analysis of empirical cases of community wind in Oregon. *Renewable and Sustainable Energy Reviews*, *17*, 54-73.

81. Simcock, N. (2014). Exploring how stakeholders in two community wind projects use a "those affected" principle to evaluate the fairness of each project's spatial boundary. *Local Environment*, *19*(3), 241-258.

82. Haf, S., & Parkhill, K. (2017). The Muillean Gaoithe and the Melin Wynt: Cultural sustainability and community owned wind energy schemes in Gaelic and Welsh speaking communities in the United Kingdom. *Energy research & social science*, *29*, 103-112.

83. Stefanelli, R. D., Walker, C., Kornelsen, D., Lewis, D., Martin, D., Masuda, J.,& Castleden, H. (2018). Renewable Energy and Energy Autonomy: How Indigenous Peoples in Canada are Shaping an Energy Future. *Environmental Reviews*, 27(1), 95-105.

84. Hoen, B., Wiser, R., Cappers, P., Thayer, M., & Sethi, G. (2011). Wind energy facilities and residential properties: the effect of proximity and view on sales prices. *Journal of Real Estate Research*, *33*(3), 279-316.

85. Watson, I., Betts, S., & Rapaport, E. (2012). Determining appropriate wind turbine setback distances: Perspectives from municipal planners in the Canadian provinces of Nova Scotia, Ontario, and Quebec. *Energy policy*, *41*, 782-789.

86. Walker, C., Baxter, J., & Ouellette, D. (2014). Beyond rhetoric to understanding determinants of wind turbine support and conflict in two Ontario, Canada communities. *Environment and Planning A*, *46*(3), 730-745.

87. Swofford, J., & Slattery, M. (2010). Public attitudes of wind energy in Texas: Local communities in close proximity to wind farms and their effect on decision-making. *Energy policy*, *38*(5), 2508-2519.

88. Thayer, R. L., & Freeman, C. M. (1987). Altamont: public perceptions of a wind energy landscape. *Landscape and urban planning*, *14*, 379-398.

89. Groth, T. M., & Vogt, C. (2014). Residents' perceptions of wind turbines: An analysis of two townships in Michigan. *Energy Policy*, *65*, 251-260.

90. Hoen, B., Firestone, J., Rand, J., Elliot, D., Hübner, G., Pohl, J., ... & Kaliski, K. (2019). Attitudes of US Wind Turbine Neighbors: Analysis of a Nationwide Survey. *Energy Policy*, *134*, 110981.

91. Warren, C. R., Lumsden, C., O'Dowd, S., & Birnie, R. V. (2005). 'Green on green': public perceptions of wind power in Scotland and Ireland. *Journal of environmental planning and management*, *48*(6), 853-875.